Voice of Innovation in Healthcare Series

ROUTLEDGE

Voices of Innovation - AI

Fulfilling the Promise of AI in Healthcare

Edited by
Edward W. Marx • Sakshika Dhingra
Frank Papay, MD • Piyush Mathur, MD

A **Productivity Press** Book

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HEALTHCARE IT

Voices of Innovation – AI

Innovation in healthcare has been both fast and slow.

As an industry, we have clearly made great technological advancements, and yet we find ourselves behind peer industries when it comes to innovation with patient care, customer experience, augmented intelligence, virtual care, and cybersecurity. One reason for the lack of innovation velocity is the need for a universally adopted model or best practice framework. The time has come for Voices of Innovation – AI. Artificial intelligence is what some call the fourth transformative revolution in human history. Healthcare is among the many industries with significant opportunities for the use of AI and machine learning, as the convergence of technology and healthcare will result in significant innovation. This book is both practical and inspirational. Using the HIMSS model for innovation as the structural framework, *Voices of Innovation – AI* will showcase the great AI innovations being implemented across healthcare globally.

With contributions from leading authorities in this field, this book will become the de facto resource for any organization seeking to leverage AI effectively. Loaded with numerous case studies and stories of successful innovation projects, this book helps the reader understand how to leverage AI to help fulfill the promise of technology in enabling superior business and clinical outcomes.

Voices of Innovation
Series Editor: Edward W. Marx

Everyone talks about innovation, and we can all point to random examples of innovation inside of healthcare information technology, but few repeatable processes exist that make innovation more routine than happenstance. How do you create and sustain a culture of innovation? What are the best practices you can refine and embed as part of your organization's DNA?
What are the potential outcomes for robust healthcare transformation when we get this innovation mystery solved? Through timely essays from leading experts, the first edition showcased the widely adopted healthcare innovation model from HIMSS and how providers could leverage to increase their velocity of digital transformation. Regardless of its promise, innovation has been slow in healthcare.

Voices of Innovation – AI leverages the same framework and construct but zeroes in on artificial intelligence to include large language models, voice and robotic process automation.

Voices of Innovation
Fulfilling the Promise of Information Technology in Healthcare, 2nd Edition
Edited by Edward W. Marx

Voices of Innovation – Payers
Opportunities for Creating Solutions to Improve Member Experience and Health
Edited by Edward W. Marx and Sakshika Dhingra

Voices of Innovation – AI
Fulfilling the Promise of AI in Healthcare
Edited by Edward W. Marx, Sakshika Dhingra, Frank Papay, and Piyush Mathur

Voices of Innovation – AI

Fulfilling the Promise of AI in Healthcare

Edward W. Marx, Sakshika Dhingra, Frank Papay,
and Piyush Mathur

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Contents

Foreword

I have known Edward W. Marx for more than 15 years. When Ed asked me to write the Foreword for *Voices of Innovation – AI*, I was both flattered and elated! I said YES, sign me up! I read Ed's previous books in the *Voices of Innovation* series and have featured him as a keynote speaker in several of our "Beckers" conferences. As a big fan, writing the Foreword is like being asked by Jay-Z to do a music collaboration (ft. S. Becker). Jesting aside, what you hold in your hands is a practical book that teaches how to innovate with impact, and specifically, AI adoption and execution. A dose of theory yet full of real examples that stand the test of time. Something we will all benefit from.

The Editors

Ed is not alone as an editor. He is joined by Shakshika Dhingra, a Payer executive who previously partnered with him on *Voices of Innovation - Payers*. To strengthen the clinical connection, Cleveland Clinic physician leaders Frank Papay and Piyush Mathur also helped. Together, the four of them oversaw the process where they collected best practices from around the world to ensure representation from organizations small and large, community-based and local. There are examples in this book all of us will relate to.

With the proven innovation construct developed by HIMSS, this book inspires and provides practical guidance on how to enable digital transformation via AI.

Why this Book

In today's landscape of healthcare, innovation is not just a buzzword; it is a critical imperative. Innovation stands as a beacon of hope and progress, guiding us toward a brighter and more effective future enabling improved clinician and patient experiences. The challenges we face in providing accessible, affordable, and high-quality healthcare to our communities demand innovative solutions. As leaders in healthcare, it is us who must drive this change and make a positive impact on the lives of those we serve.

I am delighted to introduce this groundbreaking book on AI innovation, a comprehensive guide for leaders like you. This book brings together a wealth of knowledge, insights, and strategies that will help you navigate the complex and dynamic landscape of healthcare and the myriad of areas it entails. It delves into the intricacies of transforming the way we interact with different entities and, most importantly, the members, patients, and clinicians.

The chapters explore a wide range of AI applicability. Transforming our capabilities to cure cancer, improve productivity, and enable improved experiences for patients and clinicians. Importantly, the first chapter tackles an important prerequisite. Governance and ethics of artificial intelligence. We need to get this right before embarking too far down the road on our AI journeys. You will read perspectives from physicians and nursing leaders, which set the tone for the remaining chapters.

Why Now

The journey of healthcare innovation is no longer an option; it is a necessity. With the rising costs of care, an aging population, and the ever-present need for efficient and effective healthcare services, we must adapt and innovate. *Voices of Innovation – AI* is designed to be your compass in this uncharted territory, providing you with the tools and ideas to foster and execute AI-related innovation in your organization. Survival of the Digitalist.

I encourage you to use this book as a resource, a source of inspiration, and a catalyst for change within your healthcare enterprise. The transformation of healthcare is a collective effort, and by fostering AI innovation in your organization, you can be a driving force in improving the health and well-being of countless individuals.

I applaud Ed, Sakshika, Frank, Piyush, and all the contributors for their dedication to advancing AI innovation. I thank you, the reader, for your commitment to making a difference. Together, we can ensure that healthcare remains a force for good, delivering better outcomes and experiences for all.

Let this book be your guide, your inspiration, and your call to action. The future of healthcare awaits, and with innovation as our compass, we can shape it into something remarkable.

Scott Becker
Founder and Publisher Beckers Healthcare
Partner and Former Chair HealthCare Department,
Board Member, McGuireWoods.

Acknowledgments

Edward W. Marx

I dedicate this book to my Dad, Herbert Marx. A Holocaust survivor and concentration camp escapee, Dad eventually made his way to Switzerland. First, he spent several years hidden from Nazis by Catholic nuns in a French convent. Second, he spent several years as an orphan in Geneva before the Red Cross sent him to New York to assimilate with the only known surviving family member. Drafted into the US Army post-high school, Dad spent 20 years as a soldier, followed by 20 years as a civil servant. With Mom, he raised seven children and now enjoys life with 30+ grand and great-grandchildren. At age 90, he continues to share his story of hope, forgiveness, and love. Central to his life story is resilience, something he passed on to me. Dad, thank you for giving me life and being my biggest cheerleader next to Mom. I am proud to call you Daddy.

I am also thankful for my co-editor, Sakshika Dhingra. We met a couple of years ago via an introduction from the CEO of Tech Mahindra. While I served as her mentor for one year, I learned as much from her. An innovator herself, she did much of the heavy lifting for this book you are holding.

Thank you to additional co-editors, Dr. Frank Papay and Dr. Piyush Mathur. When we served together at Cleveland Clinic, you both stood out as innovators, especially with all things AI. The global BrainX community you developed is an inspiration for many.

I dedicate this book to my oh-so-graceful mother, Smt Kamal Dhingra, and my loving husband, Vivesh Sharma. Two individuals who have been my constant source of unwavering love, support, and encouragement.

Oldest of five siblings, my mother started playing the role of the head of the household at an early age, since my grandfather was in the Indian Navy and used to be away for long periods of time, and my grandmother, one of the wisest people I've personally known, never went to school. She was and continues to be the problem solver of the family. Her journey has not been easy, and no matter what the setback was, she was always smiling and teaching my sister and me reasons to be grateful. Her sacrifices and endless support have allowed me to pursue my dreams, and her belief in me has given me the courage to face the toughest challenges.

One of the core values that defines her is "resilience". At 70, staying true to her nature, she is relearning life after my dad's demise. Any value that I can create in this lifetime, including this book, is a testament to the values and the "always keep going" attitude she has instilled in me and the foundation she has built for my life.

Vivesh, your belief in me and my work sustains me through the ups and downs of life. Thank you for being my partner in every sense of the word. This is for you.

I would like to express my deepest gratitude to my co-author, Ed Marx. His ability to rethink routine and his zest for life are an inspiration to me and many others, and I consider myself fortunate to have had the opportunity to collaborate and work closely with him on a topic we both are passionate about – Healthcare Innovation.

Sakshika Dhingra

This book is dedicated to many clinicians, data scientists, and information technology experts, from across the world who are researching and innovating tirelessly to bring data-driven solutions to solve some of the biggest challenges in healthcare. We formed BrainX, an AI in healthcare company, to investigate opportunities to apply artificial intelligence solutions to healthcare. I would like to acknowledge the dedication of this team, which has persevered to advance not just science, but also create a community around us with many partners, interns, and consultants joining us. Thanks, Ed Marx, for leading this effort and being part of our team. You are always inspiring us to do more, do better, and do faster.

Special credit goes to Raghav and Shreya, our technology leads at BrainX, who have worked hard to understand the clinical needs, educate many, and research solutions that are likely to transform healthcare. Frank, Kamal, Jacek, and Ashish, who started BrainX, are the true voices of innovation in AI, selflessly dedicating their time and efforts to create a better future for all of us with one goal – machine learning in healthcare for good.

Hope this book inspires many to think differently. From where I personally started, my goal of innovation in healthcare remains the same. Apply advanced technologies and data-driven science to improve quality and patient safety.

Piyush Mathur

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All author royalties for this book go to Mayo Clinic Foundation to help cure cancer in their names.

We think of you Herbert, Kamal, Vivesh, and the BrainX community.

About the Editors

Sakshika Dhingra is a director with Humana, currently focused on strategic and operational planning to serve their Medicaid membership. She has spent most of her career serving different population groups while working for multiple leading Payer organizations across the country. She is a results-oriented healthcare strategist with a passion for developing and implementing innovative solutions and frameworks centered around sustainability and scalability. Sakshika, a doting Mom, lives with her loving husband Vivesh Sharma and her affectionate and curious six-year-old son Aveer.

Edward W. Marx is CEO of Marx Advisory, a consultancy aimed at improving the marketplace experience for vendors and providers. A healthcare best-selling author of multiple books around innovation, transformation, and experience, all his royalties are donated toward the eradication of cancer. His writings reflect his deep expertise gained while serving as CIO of the global Cleveland Clinic and NYC Health and Hospitals. He is an advisor for start-ups and multinational companies and sits on the boards of multiple health systems. He advises governments on digital transformation strategies. When not working, Ed competes internationally for TeamUSA Triathlon and is on pace to climb the Seven Summits. Ed is married to Dr. Simran Marx, and they share 5 children and 5+ grandchildren.

Piyush Mathur, MD, FCCM, FASA, FAMIA, is a staff anesthesiologist and critical care physician at Cleveland Clinic, Ohio with more than 20 years of clinician experience. He served in the role of the Quality Improvement Officer and chair of the compliance committee at the Anesthesiology Institute, Cleveland Clinic, between 2011 and 2024 and has recently transitioned to lead innovation at the department. He is the co-founder of BrainX, an AI in healthcare company focused on translational aspects of AI in healthcare. He has also co-founded one of the largest online groups for machine learning in healthcare, BrainXCommunity.

Dr. Frank Papay, MD, DSc(hon), FACS, FAAP, is a distinguished healthcare executive, pioneering surgeon, and innovator with an impressive track record of leadership and groundbreaking contributions to medicine. Based at the Cleveland Clinic, Dr. Papay currently serves as Chairman of the Plastic Surgery Institute at the Cleveland Clinic. His leadership has driven the Plastic Surgery Department to nearly triple in size and revenue through strategic regional and international expansion, the creation of new service lines, and a 34% enhancement in clinical efficiency. His distinguished career is underpinned by a robust educational foundation, including a master's in biomedical engineering from Case Western Reserve University and double board certifications in Otolaryngology and Plastic and Reconstructive Surgery from the Cleveland Clinic. Dr. Papay's extensive expertise and leadership continue to drive significant advancements in healthcare, making him a respected and influential figure in the medical community.

About the Contributors

Merrill Anovick: 25m Health. Merrill is the co-founder and President of 25m Health. He helped launch 25m Health in partnership with Apollo, Lifepoint Health, and Scion in November 2021. He sits on the 25m Health Investment Committee and oversees both the investing and incubation strategies where he has co-founded Kouper Health, Gratia, and Ladder Health and invested in M7, Keragon, Midi Health, and Thrive Mobile.

Dr. Gregory Ator, MD, FACS, FAMIA, Chief Medical Informatics Officer, KU Medical Center: Dr. Ator is a board-certified informatician and serves as the CMIO for Kansas University. He has an electrical engineering degree and practices as an otolaryngologist with a subspeciality interest in Otology – Neurotology and Skull Base Surgery.

Raghav Awasthi: Experienced Researcher in policy modeling for Public Health with a demonstrated history of working in the higher education industry. Skilled in Causal analysis, Counterfactual modeling, Machine Learning, NLP, Linear Algebra, Research, C (programming language), R, and Python (programming language). Strong research professional with a Doctor of Philosophy – PhD focused in Computational Biology from Indraprastha Institute of Information Technology, Delhi.

Thom Bales: Principal at Strategy and PwC US Health Services Sector Lead. Tom has 20+ years in consulting with PwC Strategy and (formerly Booz & Company) focused on health operations, technology strategy, and transformation. He leads PwC's Health Services Sector and San Francisco Strategy and teams. Other past experiences include strategy setting and financial analysis in financial services, automotive, consumer products, chemicals, and energy.

Dr. Susana Bowling, MD, FAHA, FNCS, FAAN, ACC: Dr. Bowling serves as Medical Director for Summa Health's Neuroscience Institute and Akron City Hospital Comprehensive Stroke Center. She is board certified in Neurology as well as Neurocritical Care and Vascular Neurology. She is a Fellow of the American Academy of Neurology (FAAN), American Heart Association (FAHA), Fellow Neurocritical Care Society (FNCS), and Associate Certified Coach (ACC). She earned her MD and Fellowship in Vascular Neurology and Neurocritical Care (Medicine) from the University of Alabama. She worked at Beth Israel Hospital in NYC as an associate professor and later Director of the Neurocritical Care program at the Alabama Neurological Institute before coming to Summa Health System in 2008.

Casey Bryson: Casey Bryson currently serves as the Vice President of Solution Consulting at Abridge. After graduating from the University of Missouri with a focus on business administration and economics, he began his 20-year career in healthcare information technology. In his role at Abridge, Casey is able to show the world what is possible through conversational AI and bring joy to the people that take care of all of us, our clinicians. Prior to Abridge, Casey held the roles of Vice President of IT at The University of Kansas Health System, Chief Information and Innovation Officer at Hurley Medical Center, Chief Strategy Officer at Datica, and Implementation Executive at Epic Systems Corporation.

Dr. Harvey Castro, MD: Helpp.ai and Medical Intelligence Ops.
Dr. Harvey Castro is an ER physician and the Chief Medical AI Officer at Helpp.ai, focusing on AI-driven fall prevention and workflow automation in healthcare. He is also the CEO of Medical Intelligence Ops, where he integrates Large Language Models into healthcare systems. With over 20 years of experience in emergency medicine, Dr. Castro is recognized for his pioneering work in AI and healthcare, authoring multiple books and developing innovative AI solutions. He serves on various advisory boards, including the Singapore Ministry of Health and the American Board of Artificial Intelligence in Medicine. Dr. Castro's expertise spans practical AI applications in healthcare, personalized medicine, and ethical AI integration.

Grace Currie: Grace is a clinician researcher and Senior Program Manager at the Sydney Children's Hospitals Network and the University of Sydney. A leader in digital health transformation, Grace's research and hospital role focuses on operationalizing learning health systems by understanding the enablers for healthcare-embedded research technology. Grace is leading the Learning Health Initiative at the Sydney Children's Hospitals Network, which aims to transform the hospital network into a learning health system by utilizing routinely captured data for quality improvement, research, and predictive analytics.

Deborah Gash, CHCHIO: Deborah is a senior healthcare technology expert, who accelerates digital strategies, business transformation, and innovation. She is known as a forward-thinking champion for innovation and spearheads HIT solutions for a health system of 16 hospitals and 13K employees. She leverages her profound understanding of the healthcare business to develop and implement practical technology solutions to empower and enhance the health and well-being of patients, staff, and community while improving operational efficiency.

Alex Goryachev: Alex is a globally recognized AI and Innovation Leader and a Keynote Speaker, bringing a wealth of experience in formulating and executing forward-thinking digital strategies in complex environments. His tenure at global companies, such as Dell, Amgen, IBM, Pfizer, and Cisco, where he led Global Innovation Centers across 14 countries, increased revenue and accelerated the industry's digital transformation through pioneering artificial intelligence, IoT, and other digital solutions.

Kieran Donaldson: Kieran Donaldson is a highly accomplished engineering leader with a strong background in artificial intelligence, mobile, and gaming technologies. As the Vice President of Engineering at Iconic AI and technical advisor to Medigram, his expertise spans critical and innovative areas in tech. Ranked in the top 5% of tech professionals, his Oxford training, experience in regulated technology, and successful startup exit make him an invaluable part of an ideal team to partner with healthcare leaders seeking cutting-edge solutions.

Dr. Arthur Douville: Dr. Arthur Douville, CMO at Medigram and a practicing neurologist is recognized among the top 5% of physician executives, renowned for his leadership in medical administration and healthcare innovation. As a repeat health system enterprise CMO, Dr. Douville has consistently championed the integration of advanced technologies in clinical settings to improve patient care

and operational efficiency. His insights and strategic vision have made significant impacts on healthcare systems.

Sherri Douville: Sherri Douville is the CEO of Medigram, Founder and Chair of the Trustworthy Technology and Innovation Consortium (TTIC), and co-chair of the Trust SG for IEEE/UL 2933. She leads at the intersection of AI, Cybersecurity, mobility, and healthcare, setting new standards that place her among the top 1% of tech executives worldwide. Sherri's visionary leadership and strategic acumen have earned her the recognition and trust of industry leaders and policymakers, driving industry-wide advancements and shaping the future of healthcare technology.

Debra Graves – Commonwealth Care Alliance: Debra is a Medical Claims Senior Product Owner for Commonwealth Care Alliance. She has worked in the healthcare Industry for a little more than 4 years after switching industries from finance. She has her master's in health informatics from Northeastern University in Boston and is a Certified Scrum Product Owner (CSPO).

Deepak Goyal: Partner at PwC Strategy, Deepak is a seasoned healthcare technology professional with over 19 years of experience across the payer and provider sectors. Deepak currently leads the Healthcare Technology Strategy practice as part of PwC Strategy and is focused on providing IT strategy, IT transformation, Digital, Analytics, and M&A-related advisory to many national and regional healthcare providers and payers. In his role as the healthcare Technology Strategy leader, Deepak is responsible for business development, team building, capability and offering development, and managing C-suite client relationships at several healthcare clients. Deepak is a thought leader in the healthcare sector who regularly publishes his thinking and is a regular speaker at leading industry conferences.

Raouf Hajji: International Medical Community (IMC) Raouf Hajji is a co-founder and Medical Lead of the International Medical Community (IMC), an Innovative HelatTech Hub serves as a connector and resource-sharing hub for stakeholders ranging from academics to scientists to regulators. He has over 12 years of experience working in the healthcare sector, academia, biomedical research, and HealthTech innovations. He is the author, reviewer, and editor of many peer-reviewed medical journal articles and book chapters. He is also an assistant professor of Internal medicine at the Medicine Faculty of Sousse, Tunisia. He supports and mentors teams and individuals worldwide in biomedtech

innovations, research, and development. He focuses on integrating cutting-edge technologies and fostering partnerships that drive progress and innovations in medical practice, biomedical research, and academia.

Lyndsay Hercule: International Medical Community (IMC). Lyndsay Hercule is a co-founder and the Director of the International Medical Community (IMC). She advises technology startups across multiple jurisdictions. Utilizing my years of experience in International Business and Corporate Strategy, I assist in developing entrepreneurial operations in intellectual property, data security, and trade, covering various industries globally. She holds a Masters in International Business from Hult International Business School and was admitted to the Supreme Court of Brisbane, Australia, as a Solicitor.

Karen Marie Joswick, MHA, is the Founder and President of Benevolence Health. With over 20 years in healthcare, including system executive leadership roles, she is a recognized thought leader in payment innovation, accountable care, and health system operations. Karen's expertise spans value-based care, clinical program growth, health equity, and technology integration across various payer models. She holds multiple professional certifications in health IT and clinical informatics, serves as an adjunct faculty member at Jefferson University, and has been on the Board of Directors for NAACOs. Her work in driving ROI, value-based transformation, and leveraging technology for system-wide growth has made her a key figure in reshaping the healthcare industry landscape globally.

Dr. Olga Kagan, Ph.D., RN, FHIMSS, FAAAAI: Principal OKHCC; Adjunct Associate Professor CUNY SPS; Adjunct Faculty Molloy University. A registered professional nurse with over 25 years in the industry, her experience spans various clinical and academic settings, including Mount Sinai Health System, Lenox Hill Hospital, Molloy University, CUNY School of Professional Studies, and within professional organizations, including the American Nurses Association, the American Academy of Allergy Asthma and Immunology, the Health Information Management System Society, the Eastern Nursing Research Society, and the Society of Nurse Scientists, Innovators, Entrepreneurs, and Leaders.

Tatyana Kanzaveli: Open Health Network. Tatyana Kanzaveli is the Founder and CEO of Open Health Network. With extensive experience in the healthcare and technology sectors, Tatyana has been a leading force in integrating AI and GenAI-driven solutions to enhance clinical trial processes and patient care. Prior to founding Open Health Network, she held senior executive positions at prominent tech companies and has been recognized globally for her contributions to healthcare innovation and digital transformation.

Dr. Eileen Kasda, DrPH.: SafeTower Baltimore, Md. Eileen is the Vice President of Patient Safety at SafeTower, a spinout from Johns Hopkins Medicine. Dr. Kasda is a recognized leader in the field of patient safety, dedicated to transforming safety practices and culture using innovative technology with more than 14 years of experience in patient safety. She specializes in applying AI to solve problems in patient safety and grievance reporting and analysis. Prior to joining SafeTower, Eileen led the development and management of a novel, AI-driven patient safety reporting solution at Johns Hopkins Medicine in Baltimore.

Dr. Avneesh Khare – BrainX AI, USA: Dr. Avneesh Khare, a former anesthesiologist and pain management specialist, is a thought leader, educator, advisor, and consultant at the intersection of AI and medicine. As a LinkedIn Top Voice, he has established "The Med AI Capsule" initiative and contributes to "BrainX AI", focusing on machine learning in healthcare for good. Based in India, Dr. Khare is a co-founder of the "Doctors AI" online community, advocating for AI education for medical professionals. His views have been recognized and featured internationally, including at the G20 Consultation, Times Square, and Forbes.

Inderpal Kohli: Inder is the VP of IT and CIO at Englewood Health and has 25+ years of leadership in healthcare technology. He oversees IT, biomedical engineering, and digital transformation for a health system with 150+ locations. Previously, he held key roles at the Hospital for Special Surgery and Columbia University Medical Center. Kohli holds a master's in technology management, speaks at industry events, and has taught healthcare informatics at Weill Cornell Medical College.

Dr. Kamal Maheshwari MD: Kamal completed anesthesia training in India (2004) and the United States (2009). He did a fellowship in Regional Anaesthesia and Acute Pain Management at Cleveland Clinic (2010). He graduated from the MPH (2015) program at Johns Hopkins Bloomberg School of Public

Health with a specialization in health policy and management. He also received a certificate in Quality Patient Safety and Outcomes Research from the Johns Hopkins Bloomberg School of Public Health. He (2016) founded the Center of Perioperative Intelligence at the Cleveland Clinic Foundation to focus on artificial intelligence applications in perioperative medicine. He has published more than 100 peer-reviewed publications focused on improving perioperative outcomes. He founded (2022) Roojh Health, a digital health company focused on empowering doctors and patients, especially in the developing world.

Durga Malleswari Koratani: I am an aspiring EPIC Analyst with a Master of Science in Healthcare Informatics from Sacred Heart University. I completed an internship at Optimus Healthcare, where I gained hands-on experience with EPIC systems. I am passionate about leveraging technology to improve healthcare outcomes.

Craig Kwiatkowski, PharmD: Craig is Chief Information Officer and Senior Vice President of Enterprise Information Services at Cedars-Sinai. He has over 25 years of experience in healthcare, having led numerous technology initiatives aimed at improving care delivery, outcomes, user experience, and operational efficiency. Prior to joining Cedars-Sinai in 2009, Kwiatkowski held various operational and clinical leadership roles at the University of Chicago Hospitals. He holds a Doctor of Pharmacy degree from the Chicago College of Pharmacy.

Jian Liu: Jian is a highly accomplished Senior Health IT Executive with over 20 years of experience in the healthcare sector. His expertise spans strategic and digital health planning, governance, digital transformation and integration, and IT operations management. Throughout his career, Jian has shown a deep commitment to driving digital health innovation to improve healthcare quality and safety. Currently serving as the Chief Digital Health Officer and CIO at the Sydney Children's Hospitals Network, he spearheads efforts to orchestrate and optimize digital transformation initiatives within the organization.

Rohit Mahajan: Rohit is an experienced entrepreneur, investor, and leader with a demonstrated history of working in the Digital Health and Healthcare Industry. He has worked with IBM and Wipro in the past. He is the Managing Partner and CEO at BigRio and Damo Consulting. He holds a Bachelor's degree in Electronics and Communications Engineering, is a Wharton School Fellow and a graduate of the Harvard Business School. And has recently completed the Global Healthcare Leaders Program from Harvard Medical School. His first full-length book,

Quantum Care: A Deep Dive into AI for Health Delivery and Research, has been published and has been trending #1 in several categories at Amazon.

Gabriella Marcelja: International Medical Community (IMC): Gabriella Marcelja is a co-founder and the CEO of the International Medical Community (IMC). She is an entrepreneur, legal, IT, and strategy global advisor with over ten years of experience, active in four working languages. Topics of interest include criminal and international law, strategy, innovation, technology, conflict analysis, peace resolution, mediation, and foreign investments. She is also an Investor in impact projects, a startup supporter, a speaker at international and UN forums, and a university lecturer on topics such as law and technology, multilateral diplomacy, and sustainability.

Dr. Kathleen McGrow DNP, MS, RN, PMP, FHIMSS, FAAN: Dr. Kathleen McGrow, the Global Chief Nursing Information Officer at Microsoft, is a pioneering leader in the integration of innovative technologies within healthcare. With a doctor of nursing practice from the University of Maryland, Baltimore, Dr. McGrow combines her extensive clinical experience in trauma critical care with her expertise in information technology to drive digital transformation in healthcare. Her work focuses on addressing critical issues such as workforce crises, enhancing patient and consumer engagement, and leveraging cognitive computing to create a learning health system. Internationally recognized for her contributions to the intersection of clinical care and technology, Dr. McGrow has delivered numerous educational presentations, including at the prestigious International Congress of Nursing in Montreal, Canada. Her scholarly work, published in peer-reviewed journals, explores the transformative potential of artificial intelligence (AI) in healthcare, including her recent publication on foundation models and generative AI in nursing. In addition to her role at Microsoft, Dr. McGrow co-leads the HIMSS Nursing Innovation Advisory Committee and serves as an adjunct clinical instructor at the University of Alabama at Birmingham School of Nursing. Her leadership and insights continue to shape the future of healthcare, making her a vital voice in the ongoing evolution of clinical practice and technology integration.

Dr. Ashkan Memari, PhD, MEng, BEng, FHEA, is an academic and researcher at Central Queensland University in Australia, with international experience spanning the Middle East, South Asia, and Australia. Ashkan's research area revolves around sustainability, and one of his articles in the field of sustainable supplier selection ranks among the top ten most cited works globally in this field.

Dr. Memari teaches a wide range of Project Management courses catering to both undergraduate and postgraduate students.

Malissa Miot is Senior Director of Sales and Delivery at Signature Performance. Signature Performance is a leading provider of healthcare administrative solutions and services. Malissa is passionate about helping hospitals and health systems adopt innovation and workflows that improve patient outcomes, increase productivity for the administrative and care teams and reduce costs. She has served as Co-chair of the CIO Council for the New England HIMSS (NEHIMSS) Chapter. Malissa is a past president of the NEHIMSS Chapter and has been a volunteer to the NEHIMSS Board since 2013.

Shreya Mishra: Experienced Researcher in Computational Biology (Genomics) with a demonstrated history of working in the higher education industry. Skilled in Graph Signal Processing, Network Analysis, and Algorithm Development in Genomics, Machine Learning, Data Science, and Python. Strong research professional with a Doctor of Philosophy and Ph.D. focused on Computational Biology from Indraprastha Institute of Information Technology, Delhi.

Kristin Myers: – Northwell Health. Kristin Myers joined Northwell Health as the Chief Digital Officer in January 2024. She is a visionary leader with over 20 years in the healthcare industry with a focus on maturing, integrating, and harnessing the power of digital, data, and advanced technologies to enhance patient care and enrich community experiences. Prior to joining Northwell Health, Ms. Myers was the Chief Digital and Information Officer and Dean for Digital and Information Technology at Mount Sinai Health System.

Logan Nye: Logan Nye is a physician and computer scientist at Carnegie Mellon University. He is a founder of Galen Health, a medical technology platform using AI to solve complex health challenges, such as early detection and intervention of cancer.

Richard Ong, MBA, MSc, FACHE, CHCIO, CDH-E, CSPO: Over the past 15 years, Richard Ong has served in various CxO-IT roles and is currently Summa Health's Vice President of IT – Digital Product Development. He earned his MBA (Waynesburg University) and Master of Science (University of Oxford). He is a fellow of the American College of Healthcare Executives (FACHE), a Certified Healthcare CIO (CHCIO), a Certified Digital Health Executive (CDH-E), and a Certified Scrum Product Owner (CSPO).

Jennifer Owens, MS, has been working in healthcare and life sciences since 2007. Her responsibilities have included bench research, biospecimen collection, and genomics in her current role in IT with a focus on innovative projects. A longstanding interest in healthcare data led her to start her podcast, "Health Data Ethics", in 2023.

Anthony Papay: Anthony is an undergraduate student at Kent State University with a major in business management and analytics.

Brittany Partridge: Brittany Partridge is a recognized expert in healthcare technology, bringing extensive experience in integrating advanced AI solutions to enhance patient care in her role as virtual care technical manager at UCSD Health. She's honored to be a fellow of the American Medical Informatics Association, where she serves on the policy committee. Brittany has led numerous projects that bridge the gap between technology and healthcare delivery, making significant strides in improving clinical outcomes.

Matt Partridge: Matt Partridge, co-founder of the Trustworthy Technology and Innovation Consortium (TTIC), is a leading figure in the field of AI and healthcare. His work focuses on developing and implementing trustworthy AI systems that ensure safety, efficacy, and ethical standards. Matt's contributions to TTIC have been pivotal in setting industry standards for AI in healthcare, fostering innovation while maintaining rigorous compliance.

Anupriya Ramraj: Principal at PwC's Cloud Practice, Anu is a recognized expert in healthcare digitization and transformation. With a distinguished career spanning over 28 years, Anu has held pivotal global leadership roles at Unisys, DXC Technology, and Hewlett-Packard Enterprise. She has a proven track record of scaling cloud practices, engineering groundbreaking products, and driving digital innovation in healthcare leveraging cloud and AI. She is a regular contributor to Forbes Tech, and her contributions to the field have earned her prestigious accolades such as the Cloud Girls Rising Trailblazer Award and recognition as one of Consulting Reports's Top 25 Digital Transformation Leaders. Anupriya's strategic vision and technical expertise continue to propel innovative healthcare solutions on a global scale, making her a leading voice in the intersection of cloud technology and healthcare.

Wael Saasouh: Board-certified anesthesiologist with work experience at multiple major academic centers. Established clinical research record with a focus on perioperative medicine, medical innovation, noninvasive monitoring, medical technology, and medical informatics.

Vinaya Sree Samala: Vinaya is a recent graduate with a Master's in healthcare informatics from Sacred Heart University. Vinaya is a dentist from India by profession with over one year of experience and has also worked as a dental assistant in Canada for more than two years before moving to the United States for further studies. Passionate about integrating technology and healthcare, Vinaya aims to bridge the gap by using data for better and more valued healthcare outcomes through innovative solutions.

Dr. Anna E. Schoenbaum, DNP, MS, RN, NI-BC, FHIMSS: Dr. Anna Schoenbaum is Vice President of Application and Digital Health at Penn Medicine. With over 30 years of experience in healthcare, she began her career as a pediatric intensive care nurse. Dr. Schoenbaum leads complex transformation projects aimed at enhancing the health ecosystem, with a focus on advancing health and advocating for health equity. She also serves as the co-chair of the HIMSS Innovation Advisory Nursing Workgroup and participates in several advisory and informatics committees. Additionally, she is an adjunct faculty member at the University of Maryland School of Nursing. In recognition of her contributions to the Health IT field, Dr. Schoenbaum received the 2023 HIMSS and ANI Changemaker Nursing Informatics award and will be inducted into the American Academy of Nursing in the fall.

Michael Schostak: Michael is a seasoned healthcare leader with a proven track record in delivering excellence and innovation within the dynamic realm of perioperative care. His career journey has been marked by a relentless commitment to enhancing patient care, streamlining healthcare logistics, and optimizing healthcare operations. He is committed to staying at the forefront of healthcare innovation, currently pursuing education in artificial intelligence in healthcare. This forward-thinking approach reflects my dedication to shaping the future of healthcare leadership.

Greg Skulmoski, PhD, MBA, BEd, CITP, FBCS: Greg is an award-winning project manager who teaches project and risk management at Bond University, Australia. With 15 years of healthcare project experience in the Middle East and Canada, his research is practitioner-oriented and aligned with best practices found in global standards. He wrote *Shields Up: Cybersecurity Project Management (2022) and Cybersecurity Training: A Pathway to Readiness (2023). Dr. Skulmoski and Dr. Ashkan Memari wrote Quantum Cybersecurity Program Management (2024).*

Alan Smith: Lifepoint Health. Al is the Chief Information and Innovation Officer at Lifepoint Health. He has 35+ years working in IT across multiple industries, with the last 25+ years working exclusively in US healthcare companies. Prior to joining Lifepoint, he was the CIO at RCCH Healthcare and Capella Healthcare. He is also a Venture Partner with Caduceus Capital Partners and serves on multiple vendor customer advisory boards.

Kannan Srinivasan: A proven award-winning leader and strategist having 24 years of experience recognized for translating business imperatives into actionable deliverables using a range of influencing skills to obtain stakeholder buy-in at all levels. A very active member in building and supporting the cybersecurity community by giving keynote addresses, webinars, and conducting sessions for SMB organizations.

Kumar Subramaniam, DBA: SafeTower, Inc. Baltimore, USA. Kumar is the President and CEO of SafeTower, a spinout of Johns Hopkins Medicine. He has more than 24 years of experience working in the healthcare sector in various leadership roles in health systems and health plans. Prior to joining SafeTower, Inc., Kumar led the solutions and innovation business unit at Johns Hopkins Health Plans in Baltimore, MD.

Kimberly Szymczak, MSN, APRN-GCNS, SCRN: Kim Szymczak serves as Summa Health Stroke Program Coordinator and has worked with the stroke population for more than 15 years and with Summa for almost 35 years. She earned her BSN from the University of Akron and her MSN from Kent State University. She is certified as a Gerontological Clinical Nurse Specialist, Stroke Certified Registered Nurse, along with having a Fellowship as an Acute Neurovascular Advanced Practitioner.

Ginny Torno, Administrative Director of Innovation and Clinical Systems at Houston Methodist, has over 23 years of technical leadership experience, with over 12 of those years at Houston Methodist in progressive leadership roles. Her current role spans strategy and leadership for inpatient clinical systems involving nursing, virtual health, medical device integration, imaging, pharmacy, lab, operating rooms, emergency departments, cardiology, and research systems. Ginny also plays an instrumental role in the Center for Innovation at Houston Methodist, focusing on smart hospital functionality and technologies that advance and improve the patient, nurse, and physician experience. One current initiative is a large-scale, multi-pronged initiative internally branded as "Care Redesign", which transforms patient care through technology and processes. Voices of patients and care teams play a significant role in this transformation, with the goal of eliminating computers from patient rooms by enabling patient interactions through voice-enabled technology.

Khalid Turk, MBA, PMP, PMI – ACP, CHCIO, CDH-E, ITIL: As a seasoned executive IT leader with over two decades of experience in the healthcare IT sector, Khalid has consistently driven digital transformation and strategic initiatives that enhance operational efficiency and patient care. His journey from hands-on technical roles to leading IT divisions showcases Khalid's ability to innovate and lead. He specializes in building and directing high-performing teams to implement cutting-edge technology solutions, with extensive experience in implementing Epic EHR systems across multiple organizations.

Addobea Twum: International Medical Community (IMC). Addobea Twum is a co-founder and the Legal Lead at IMC. She has years of experience in legal consulting, managing ISO compliance projects in the oil and shipping sector and conducting GRC and ESG training for public sector agencies in the utilities sector. She has professional experience in International Development. Conducting in-country security assessments, drafting subcontractor agreements for USAID solicitations and leading on GAC, GTZ/ GIZ funded projects. She is a member of the Commonwealth Association of Legislative Counsel and the International Association of Legislation (IAL). She holds an LLB from Lancaster University, UK and an LLM from Université Paris Panthéon-Assas, France.

Shareni De la Rosa Xochitiotz: International Medical Community (IMC): Shareni De la Rosa Xochitiotz is a Co-founder and the Innovation Lead of the International Medical Community (IMC). She is an Industrial Designer from Mexico, driven by a strong social consciousness and a commitment to enhancing

the quality of life through design as a powerful tool to address social challenges and, as a result, create a positive impact on society. Her experience includes research and development of innovative products by employing user-centered practices, social design methodologies, and collaborative processes rooted in the study of people's needs.

Voices of Innovation Series

We published the original *Voices of Innovation…Fulfilling the Promise of Information Technology in Healthcare* in the Spring of 2019. Little did we know that a few months later, COVID-19 would completely disrupt life as we knew it. Innovation and Digital Transformation became everyday vernacular and *Voices* went on to sell very well. Our publisher returned in late 2022 asking for a second Edition. The publisher made a good point in that there were so many new stories of innovation born from the pandemic that it would help the industry to update the book. We updated almost half of the content with COVID-19-inspired innovations. *Voices, 2nd Edition*, was published in July 2023.

With the success of the books, we heard requests from many other communities for *Voices* that were increasingly specific to their healthcare vertical or focused on a particular topic.

We came out of the gate with *Voices of Innovation - Payers*. Like their provider counterparts, payers also long to transform, and innovation is a catalyst to spark change of such magnitude. With Sachin Jain MD writing the Foreword, we published *Voices of Innovation - Payers* in July 2024. An immediate best-seller, it was the first book ever written addressing the leverage of technology in the payer community.

With all the buzz surrounding artificial intelligence, large language models, and robotic process automation, our readers began to ask for *Voices of Innovation – AI*. While there are many books already written on the topic with more to follow, *Voices of Innovation – AI* differentiates itself by focusing on repeatable processes, not strictly examples, which quickly lose impact given the rapid nature of AI innovation. While we applaud these books, *Voices of Innovation – AI* is meant to be a handbook to help practitioners today and tomorrow in their AI-related innovations.

The beauty of *Voices* is that the books remain a set of global best practices where peers openly share their playbooks for transformation around a common structure for innovation that is easily adaptable for any size organization. A leader can pick

up a copy of *Voices* and instantly have access to a tried and tested framework for innovation with multiple "case studies" of how other payer organizations have succeeded, complete with results. This is the reason for the success of all the *Voices* books. Look for more *voices* in the future.

Voices of Innovation—AI Prologue

Everyone talks about innovation, and we can all point to random examples of innovation inside of healthcare information technology, but few repeatable processes exist that make innovation more routine than happenstance. How do you create and sustain a culture of innovation? What are the best practices you can refine and embed as part of your organization's DNA?

What are the potential outcomes for robust healthcare transformation when we get this innovation mystery solved? Through timely essays from leading experts, the first edition showcased the widely adopted healthcare innovation model from HIMSS and how providers could leverage it to increase their velocity of digital transformation. Regardless of its promise, innovation has been slow in healthcare.

Voices of Innovation – AI edition leverages the same framework and construct but zeroes in on artificial intelligence to include large language models, voice, and robotic process automation.

The hype of AI has certainly reached a fever pitch in 2024, and at this time we don't see the excitement slowing down. We believe AI holds more promise than previously hyped technological advances such as Cloud and Blockchain. Our reasoning is simple. AI has actually been around in some form for a generation, so the foundations are strong. As computing power becomes more ubiquitous and data accessible, use cases demonstrating value are now routine. Many experiments have now transitioned to mainstream utilization. AI is already embedded in numerous processes and technologies. Vendors have embraced AI as a prerequisite for long-term success and most products today are AI-enabled. AI is not only here to stay, but will continue to proliferate exponentially.

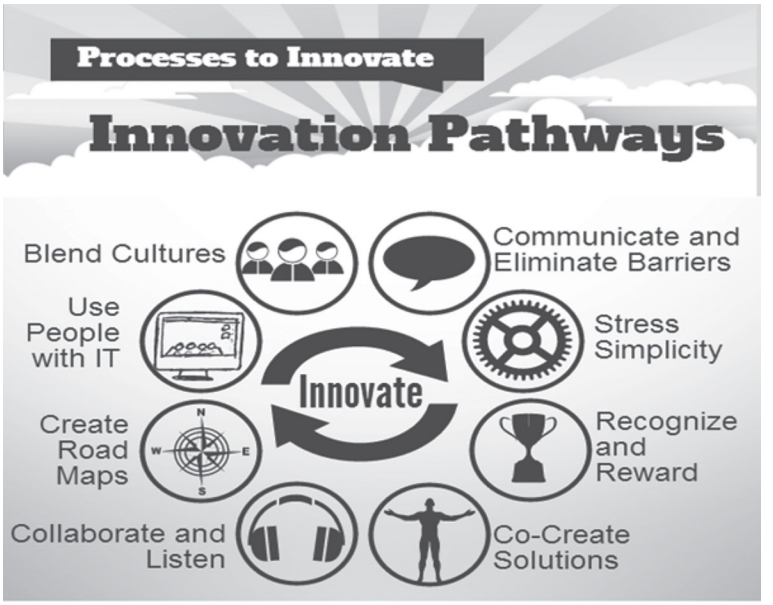
When I served as Chief Information Officer at Cleveland Clinic, we announced AI as the #2 most critical medical innovation of 2019. Even 5 years ago, AI was

already front and center in the healthcare community. In my talk, I stressed AI as "augmented intelligence", not purely "artificial intelligence".

You will find this subtle yet critical nuance in the innovations shared in each chapter. We highlight the steps in the innovation process where you can leverage AI as a partner in enabling transformation at scale.

Inside you will find over 30 real-world examples (and two AI-generated) where leaders share how they innovated with AI and the impacts on their organizations. We include examples from providers around the world that apply to small organizations as well as those hyper-complex. We demonstrate the impacts in multiple areas, including clinical outcomes, financial performance, and overall experience. No matter the size of your organization or the number of your staff, *Voices of Innovation – AI* will accelerate your capability to generate value from this amazing technology asset. In fact, those who fail to embrace AI will have difficulty in our complex industry, which is under constant disintermediation by new and emboldened entrants. Survival of the Digitialist.

As with all *Voices* titles, 100% of author royalties are donated to charities whose focus is to eliminate cancer. *Voices of Innovation – AI* proceeds will fund cancer research at the Mayo Clinic.



Innovation Framework

Welcome reader to the *Voices of Innovation* Booklet.

As we prepare for the release of the upcoming book, ***Voices of Innovation: Using AI in Healthcare*** by Ed Marx, CEO of Marx Advisory, we wanted to give you an early look at the transformative work being done by Harmony Healthcare IT in healthcare through AI. This booklet serves as a preview of the groundbreaking advancements across AI in healthcare, offering insights into some of the most pressing challenges today.

In the book, you'll find a chapter on the launch of Harmony Healthcare IT's AI-powered platform, ClearWay. Marx highlights how this innovative solution transforms clinical data abstraction and submission, reducing time by up to 80%, improving accuracy, and enhancing patient care ClearWay is the result of our recent acquisition of Trinisys adding to our advanced AI and natural language processing (NLP) solutions to process both structured and unstructured data. By automating traditionally manual tasks, ClearWay frees up valuable time for clinical professionals—such as nurses, abstractors, and quality staff—allowing them to focus on more impactful activities like patient care and quality initiatives.

As you will read in the book, Marx wrote, "ClearWay has made the registry abstraction process faster, more accurate, and far more efficient. By allowing organizations to shift resources toward more strategic work, it ultimately leads to better patient care and outcomes."

At Harmony Healthcare IT we are committed to empowering organizations with the tools and insights needed to achieve results and provide better patient outcomes. We believe that innovation should be accessible, scalable, and, most importantly, impactful. Whether you're a healthcare provider, a technology partner,

or a policy leader, we hope this booklet sparks your interest in the book, ***Voices of Innovation: Using AI in Healthcare.***

We look forward to continuing this conversation and helping you harness the full potential of AI in healthcare to improve the lives of the people we serve.

Best,
Tom Liddell, CEO Harmony Healthcare IT

Leveraging AI to reduce administrative tasks in Healthcare

It's no secret that in today's busy health system environment, every minute is precious, and resources are stretched thin and in short supply – especially clinical resources. That environment is today's reality, and the challenges that every health system faces are daunting and ever-growing. However, amidst these challenges, literature suggests there is a beacon of hope: Artificial Intelligence (AI). The rapid progress of AI has made it a buzzword in healthcare; however, its tangible benefits and optimal use cases have proven to be elusive. Additionally, AI requires not only the right technical capabilities but specific skills to develop applications for its use. Not all healthcare provider organizations can bridge these capability gaps or innovate to generate tangible benefits.

With that in mind, the innovation team began to look for specific areas within the organization that made sense to be automated. The opportunities were focused on trying to find areas within the organization that could be automated specifically to take some of the burden off nurses. As the team dug into these questions, one of the biggest pain points that stuck out was the data abstraction and submission for clinical data registries (CDRs). Participation in CDRs is vital for hospitals, offering benefits in quality improvement, research, compliance, and cost reduction. However, the process of completing registry forms and submitting them to the proper data collection group is painstakingly manual and tedious. There were applications in place in the organization that were leveraged to help with quality data submission, but they did not fully automate the process. Even worse, due to the complicated nature of these registries and the knowledge that must go into them, the work is often performed by highly skilled clinical resources.

A team was created under the sponsorship of executive leadership in the quality areas to investigate and determine if the chart abstraction processes could be automated. It became clear very quickly after researching vendor solutions that this technology did not exist for the specialty registries – especially for the full automation that the team was seeking. The organization attempted to build a solution but learned it did not have the technology platform or technical skills necessary to create the solution. As the CIO, meeting with vendors and learning about their solutions is just part of the job. Experience has shown that partnerships with vendors to solve unique problems can be effective and speed innovation. It was in one of these meetings that a hypothesis for an application of a vendor solution to solve a unique challenge emerged.

Objectives

If the organization could Automate the abstraction and submission of these registries, it would allow the nurses performing this administrative work to be transitioned back into more of a clinical or bedside role. In an exploratory meeting with Trinisys, a leading healthcare software company based in Nashville, TN, a unique application of their capabilities emerged that could solve the objective the organization was seeking. Trinisys has specialized in data integration and process automation for over 20 years, making them an ideal partner for this ambitious project. They also weren't trying to sell consultants or remote abstractors to fix the problem; both organizations were aligned to fix this problem with software. To put it simply, both recognized this problem, and both wanted to solve it with technology.

The hypothesis was that together, both organizations could pull the necessary data out of the EHR and supporting technology platforms to populate the registry fields. With that as a starting point, the goal then became clear: automate the entire registry process without needing any human interaction. The potential impact would then be enormous. Not only would this partnership save time, money, and resources, but it would also standardize data entry, leading to improved performance, better patient outcomes, and easier paths to research and innovation. No matter how excellent the team was, the manual nature of abstraction lends itself to inconsistencies and/or mistakes. Looking at a patient chart that has mountains of pages and data, and then having to fill out a registry form that has hundreds of fields is something that will always be prone to errors.

Solution

Trinisys used their core software platform, Convergence, as the base for building "ClearWay," their registry automation product. They had a long history in archiving legacy data and therefore had already built an extensive set of rules for extracting and making sense of EHR data. The combined team started with the assumption that they would be able to leverage ETL to obtain discrete data that could be used to automatically fill in most of the registry fields. Natural Language Processing and AI technologies would then be layered on top to be the "icing on the cake" to interpret complex data and follow the coding instructions for each registry.

The innovation team also wanted to start with a specific group of registries for the automation. As they looked at the book of registries that the organization participated in, the cardiac area stuck out as a natural place to start. This was due to the complexity of the cardiac registries, the number of nurses that were dedicated to that area, and the clear need to have accurate data in those submissions. If this worked, it would free up the Abstraction resources tremendously. Instead of skilled clinical resources spending hours filling out and submitting one registry form, ClearWay would automate this process. The partnership with Trinisys would achieve significant time savings and resource reallocation.

Assumptions

At the start of the project, the team had a series of assumptions that guided the proof of concept and initial implementation. These were:

1. Natural Language Processing (NLP) is powerful enough to solve the problem of abstracting registry fields.
2. Many of the fields could be handled using discrete data elements, leaving only a subset of fields that require NLP processing.
3. Answering registry questions is straight forward - skills required in data mapping were sufficient to complete much of the task.

Reality

Scope

The sheer size and complexity of the problem was initially underestimated, stemming from a lack of clinical domain knowledge and registry experience within the technical team. Additionally, the subject matter experts were initially not able to fully convey all the challenges to the implementation team, which

was understandable since this had never been done! The extensive data elements required for registries and the high percentage of fields needing complex reasoning over multiple data points presented numerous difficult-to-manage challenges.

Artificial Intelligence

Experimenting with AI technologies can be exciting, often yielding impressive results in proof-of-concept stages. However, this can also lead to overconfidence in operationalizing the technology for real-world problem-solving. If that is combined with a misunderstanding of the scope and complexity of the problem, it can result in unrealistic expectations regarding the capabilities and effort needed to solve it.

Incorporating AI across different domains also presents challenges in effectively leveraging it. Interpreting AI results can be a massive undertaking, and selecting the appropriate AI technique for each problem requires considerable effort. If one technique proves inadequate, adopting a new approach entails its own learning curve and integration effort, which may yield little to no gain.

Fine-tuning the 'creativity' or 'level of connection making' of an AI engine is another challenge. On one end of the spectrum, the engine may produce too many 'false positives,' while on the other, it may overlook relevant data. Both scenarios must be avoided. Too many 'false positives' can lead users to disregard valid evidence (like the boy who cried wolf), undermining the system's effectiveness.

Types of AI

Computer Aided Coding NLP

Computer Aided Coding (CAC) solutions have been well-established in the market for years, primarily focused on billing tasks such as generating ICD-10 codes. While these offerings are robust and effective for their intended purpose, they may have limited applicability for projects like registry automation or other similar initiatives.

Many of the established Natural Language Processing (NLP) engines in healthcare are designed with a focus on CAC, which may not align perfectly with the needs of projects requiring broader automation or analysis beyond coding.

Healthcare Specific NLP

Some healthcare-specific Natural Language Processing (NLP) engines prioritize SNOMED or the Unified Medical Language System (UMLS) over ICD-10, as they offer greater precision. However, these engines can sometimes be overly aggressive in making connections, leading to an increase in false positives.

Depending on the methodology employed, these engines may have issues with context understanding, being too inclusive and linking unrelated pieces of evidence, which can result in errors. Careful consideration of these factors is essential when leveraging these NLP engines for healthcare applications.

Large Language Models (LLMs)

Large Language Models (LLMs) have gained popularity, especially with the release of OpenAI's ChatGPT products. While these tools offer significant advantages in understanding unstructured text with high accuracy, they present challenges for HIPAA compliance, though these challenges are not insurmountable.

One strength of LLMs is their ability to comprehend language effectively. However, operationalizing the output can be challenging due to the often-longwinded nature of the responses, which can complicate result interpretation. This challenge can be addressed through prompt engineering, a concept that may be new to many technologists.

Two additional concerns with LLMs are false positives, often referred to as "hallucinations," and ensuring the LLM's understanding of medical jargon is comprehensive. Addressing these concerns requires careful consideration and potentially additional fine-tuning of the model.

Specific Challenging Examples

Registry submission involves answering questions using information from a patient's legal health record, a process known as abstraction. Some fields, like "first name" or "date of birth," are straightforward. Others, like determining the highest Creatine value between procedures or discharge, require more complex comparisons. Some fields even require understanding of the provider's decision-making process.

Abstraction often demands domain knowledge or experience with the Electronic Health Record (EHR). For example, a lab value could be documented in multiple places. Many fields have intricate rules dictating which evidence is relevant and when.

Here is an example of a relatively simple registry question along with the information you need to successfully answer it: *Has the patient experienced Atrial Fibrillation in the past week?*

If looking through the chart for terms such as 'Atrial Fibrillation', 'AFib' and other variations, you must also reduce your search to the week prior to the procedure due to the specific coding rules. However, documents from that week may contain historical references like 'History of Atrial Fibrillation' without

indicating when it occurred. Using simple text searches could lead to false positives in such cases. To successfully answer this relatively simple question using AI, you must:

1. Have all the relevant documents, along with the appropriate meta data, such as document date.
2. Find relevant references, which could include synonyms, acronyms, and potential misspellings.
3. Understand the references and context surrounding a term to determine if the condition actually occurred, and, if so, when it happened. This can include looking for specific mentions of dates, events, or indicators that provide temporal information about the occurrence.
4. Once these are completed, then all the relevant evidence and related meta data must be processed. For instance, a patient may have experienced Afib, but if it occurred before the 7-day cutoff, it would be considered invalid.

HIPAA Concerns

When selecting tools for a project, it's important to consider various factors such as initial cost, ongoing support, and HIPAA compliance. The ability to comply with existing data governance policies and procedures is also crucial.

When working with a third party for Artificial Intelligence, there's an additional level of scrutiny required when executing Business Associates Agreements, especially when dealing with large datasets. This can add complexity to an already challenging project.

Overcoming Challenges

The key to success in a complex project involving new artificial intelligence-based technologies is to establish clear and concise goals that align with an overarching guiding principle. For this project, the guiding principle was to significantly reduce the time abstractors spent on registry automation while maintaining or improving accuracy. To achieve this, the team set specific accuracy measurement goals for each field. If a field did not meet the desired accuracy level, there had to be a mechanism to guide the user through manual review of the evidence for that field.

From a technical perspective, several factors were critical to overcoming this challenge. The team utilized a large dataset for testing and implemented a systematic approach to verify results. A user-friendly interface was essential, benefiting both abstractors and the implementation team for verification and

mapping work. Although this required significant upfront and ongoing effort, the investment yielded substantial returns.

Central to our approach was a robust system framework developed by Trinisys, incorporating an ETL tool, interface engine, API management, workflow, process choreography, and security measures. This platform enabled the team to quickly adapt to new information and adjust course as needed.

Large Data Set

A crucial element of most AI projects is access to large datasets. The team transitioned from a proof of concept using a small set of examples with limited fields to leveraging a large dataset encompassing all fields for the initial registry. To achieve this, the ingested one to two years' worth of historically abstracted patient data into our system for each registry. This data served as test cases for our abstraction rules. Additionally, they analyzed how often a certain field was answered in a particular way, aiding in the creation of comprehensive test sets. The goal was to cover as many scenarios as possible.

However, this approach uncovered some unexpected challenges. The historical data was not always 100% accurate, partly due to human errors and partly due to changes in coding guidelines. These changes could result from updates from the registry provider or new understandings gained by abstractors for specific fields over time.

Systematic Verification

A detailed daily account of the system's accuracy not only helped the team focus and assess their performance but also provided leadership with a clear view of overall progress through measurable metrics, replacing reliance on anecdotal evidence and intuition. To achieve this, the team developed a systematic approach to evaluate our implementation against a large dataset of historically abstracted patient data. This involved running batches of test cases, reporting results, and the ability to delve into specific test cases to troubleshoot errors. As the project advanced, the team introduced a 'nightly build process' to run test cases for all registries under development, generating a morning report highlighting improved accuracy and potential regressions. Additionally, they integrated a drill-down feature in reports, leveraging abstraction review screens to test UI capabilities, resulting in valuable features that also proved useful during normal abstraction processes.

Strong User Interface

Implementing systematic verification was challenging but crucial for maintaining the implementation team's productivity and ensuring an accurate progress overview for a registry implementation. This capability allowed for tracking progress over time and swiftly delving into field details, significantly reducing the mental load on users by consolidating information sources. This mirrored the problem-solving approach for abstractors. The user interface needed to be sophisticated to manage a complex problem with numerous data elements effectively. The extra time dedicated to UI development proved worthwhile.

Despite this, the team faced complexities in feature development for our review process, needing to balance perceived time savings against development and testing efforts. The team also carefully considered any additional guardrails or structural changes in the system to avoid reducing flexibility, a common consideration in automation and applicable to our internal technical team's processes.

Framework

The system was designed as a flexible framework, which allowed the team to integrate new techniques and apply rules to results. Three separate AI technologies were utilized, as well as three more traditional techniques during implementation. The configuration UI allowed the team to set rules for each engine's results and enable or disable each engine per field, optimizing the use of engines for different types of fields. This significantly accelerated the implementation process.

A central concept in the approach was choreography, where the system orchestrates technology, data, and user input to create a cohesive solution. This involved not only the standard abstraction review process but also handling error conditions, validation warnings, and maintaining field mapping accuracy.

Lessons Learned

Upon completing our initial implementation, the team identified areas for improvement and keys to our success. The most impactful factors were our agile implementation approach and having a fully aligned, partnership approach.

Agile Approach

A large part of our success was driven by a measurable and adaptable approach, supported by a strong, cohesive team. Utilizing an appropriate framework and tools also enabled swift responses and turnaround times. As new challenges arose, the team's ability to adapt and try new approaches was crucial. Early end user

involvement, while potentially challenging, allowed for quick adjustments based on new insights from those end users.

A successful agile approach depended on a fully aligned team. The Trinisys robust technology platform and a well thought out, flexible approach enabled us to react quickly as the team deepened their understanding of the problems faced.

Aligned Team

Progress in such a vast problem space required harnessing the expertise of subject matter experts, architects, and technologists, all working towards a clear end goal, or 'North Star'. A common challenge in technology projects is to stray from the original goal, despite the best of intentions. This can happen due to under-specification or misunderstandings among stakeholders, or a shift in goals as the project progresses. Projects can also be hindered by internal spin, with certain leaders painting an overly positive picture while actual results fall short from stakeholder expectations.

Ensuring alignment among end users is also crucial; concerns about job security or workload can lead to misalignment. Engaging the entire team in the project's mission, guided by a clear and transparent goal, was essential for the success of this complicated project.

Results

To avoid burying the lede, the team achieved immense success in this partnership. However, that success ended up being slightly different than the original hypothesis. The team realized throughout this process that some human interaction would still be needed. There are many times in a patient chart where the data shows conflicting evidence and judgement calls made by an Abstractor were still required.

The goal was changed to increasing efficiency by ~10x and to put every available tool right at the fingertips of the Abstractors. Through the use of the rules engines, NLP, and AI, Trinisys automated the population of all fields, with any conflicting evidence automatically flagged for review. With this result, Abstractors could now simply click through the fields (usually <10) that needed manual review, be taken directly to the evidence in the patient's chart and make the decision. This took our average time per chart submission from 60+ minutes to ~5 minutes. Not only were we now faster and much more efficient, but ClearWay was filling out all fields with a 95+ percent level of accuracy. Even though we determined that the organizations wasn't able to completely move away from human elements,

the Trinisys partnership ensured that the abstraction team was now quicker, more accurate, and much more efficient. This also allowed the possibility to reallocate many of the highly valuable resources into more strategic work.

The Q/A process started proving one of the original theories correct, that ClearWay was proving to be more correct than the manual abstraction. 'Errors' would show up in ClearWay's results weren't errors at all. The team discovered that the previous manual submissions that ClearWay was run against for an initial quality baseline were the ones that were incorrect, with ClearWay's decision making proving to be technically correct. With all of the rules, NLP, and AI built in, ClearWay was able to process an immense amount of data instantly. With many of the fields previously requiring detailed manual research, it was easy to see why certain fields were so mentally taxing and more prone to mistakes.

In addition to the actual abstraction of the data, an unexpected but immensely impactful achievement was the automation of patient lists. Prior to ClearWay, our Abstraction teams spent countless hours (it wasn't officially measured) determining which patients were eligible for a particular registry. With ClearWay, Trinisys automated that process by having every eligible patient auto-populated onto the home screen when the Abstractor logs in to the platform. Daily feeds from the EHR allowed this possibility, showing all of the pre-requisites the eligible patients had met (or not), whether they were part of a research study, and whether or not they were ready for abstraction.

Conclusion

In conclusion, the partnership with Trinisys and the development of ClearWay have transformed the registry abstraction process, making it faster, more accurate, and significantly more efficient. While human judgment is still required in some cases, ClearWay has allowed us to reallocate valuable resources to more strategic work, ultimately improving patient care and outcomes.

harmony
HEALTHCARE IT

Innovation in healthcare has been both fast and slow.

As an industry we have clearly made great technological advancements and yet we find ourselves behind peer industries when it comes to innovation with patient, customer experience, augmented intelligence, virtual care and cybersecurity. One reason for the lack of innovation velocity is the need for a universally adopted model or best practice framework. The time has come for Voices of Innovation - AI. Artificial Intelligence is what some call the 4th transformative revolution in human history. Healthcare is among the many industries with significant opportunities for the use of AI and machine learning as the convergence of technology and healthcare will result in significant innovation. This book is both practical and inspirational. Using the HIMSS model for innovation as the structural framework, Voices of Innovation - AI will showcase the great AI innovations being implemented across healthcare globally.

With contributions from leading authorities in this field, this book will become the defacto goto resource for any organization seeking to leverage AI effectively. Loaded with numerous case studies and stories of successful innovation projects, this book helps the reader understand how to leverage AI to help fulfill the promise of technology in enabling superior business and clinical outcomes.

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